MUREX

Transtig AC/DC 203i
Transtig AC/DC 353i

Service Manual

1.7.99

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MUREX Transtig AC/DC 203I, 353i & T.W.C.U.

SERVICE MANUAL

KEYNOTES

- The 203i & 353i operate from balanced 3 phase 415V (±10%) 50/60Hz supplies
- They use inverter based IGBT technology with μP control
- Operator controls are a mix of rotary & keyswitch types
- In AC TIG mode HF is off whilst the arc is running
- Both AC balance & AC frequency can be set (10-90%, 20-200Hz)
- The LCD display gives preset &, whilst welding, actual values
- The 203i & 353i use identical primary inverter & Tx/Rect. PCB assemblies. The 353i uses 2 sets in parallel each delivering ½ of the output current
- The local/remote control selector is a potentiometer/switch. With the switch off, fully anticlockwise, the control is local. Turning the control up sets the machine to remote mode and enables the minimum current A_{min} set by the remote device, e.g. the FC-5B footcontrol, to be preset. **Note** the remote control must be connected for the remote A_{min} control to work correctly
- The T.W.C.U. operates from a 230V 1 phase supply (6.3A slow fuse) provided by the 203i or 353i via an internal rear panel mounted terminal board
- The T.W.C.U. contains a pressure switch which operates an audible and visible alarm if the coolant flow fails. The pressure switch is in the water return path and requires positive pressure to be OK

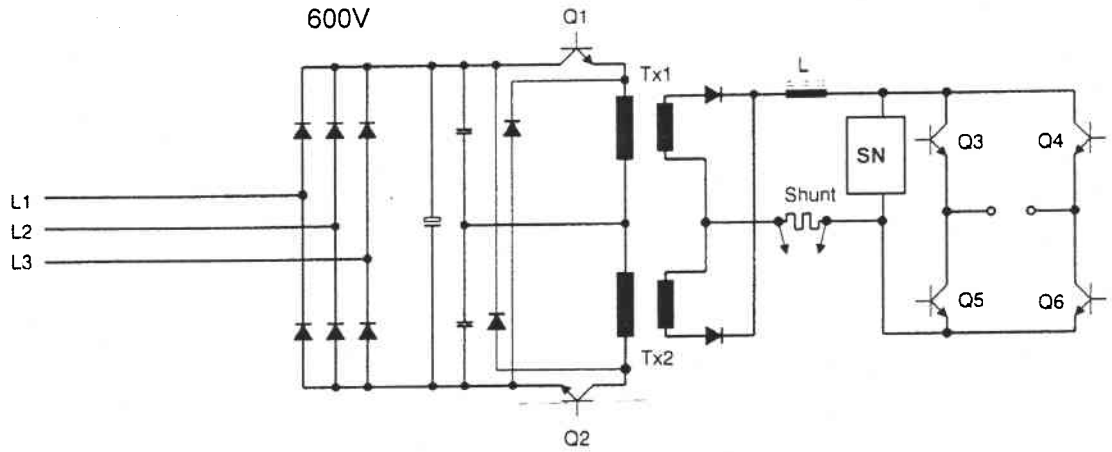
WARRANTY

The Transtig AC/DC 203i & 353i and the Transtig T.W.C.U. are guaranteed for 2 years from date of sale. Note that this warranty excludes torches, cables and hoses etc.

SAFETY

- **The extension pieces at the top of the rear uprights of the trolley unit must be removed in the case of the 203i**
- **When the 203i or 353i are mounted on the trolley unit do not remove the machine lid without first ensuring the unit cannot slide backwards off the trolley!**
- **High voltages are present inside the machines. The primary inverter PCB(s) have 600Vdc on them, even on aluminium heatsinks!**

BASIC PRINCIPLE OF OPERATION



QI to Q6 each comprise parallel sets of IGBTs, Insulated Gate Bipolar Transistors. For ease of understanding these are shown as single conventional NPN transistors in the above diagram.

The 3 phase 415V supply is rectified and smoothed creating a 600V dc line. This dc supply is then centre tapped by a pair of series capacitors (300Vdc each). IGBTs QI and Q2 alternately connect the primaries of high frequency transformers Txl and Tx2 to each of the 300V sources. Fast recovery diodes freewheel the inductive energy stored in each transformer. The basic switching frequency is around 60kHz and PWM control is used.

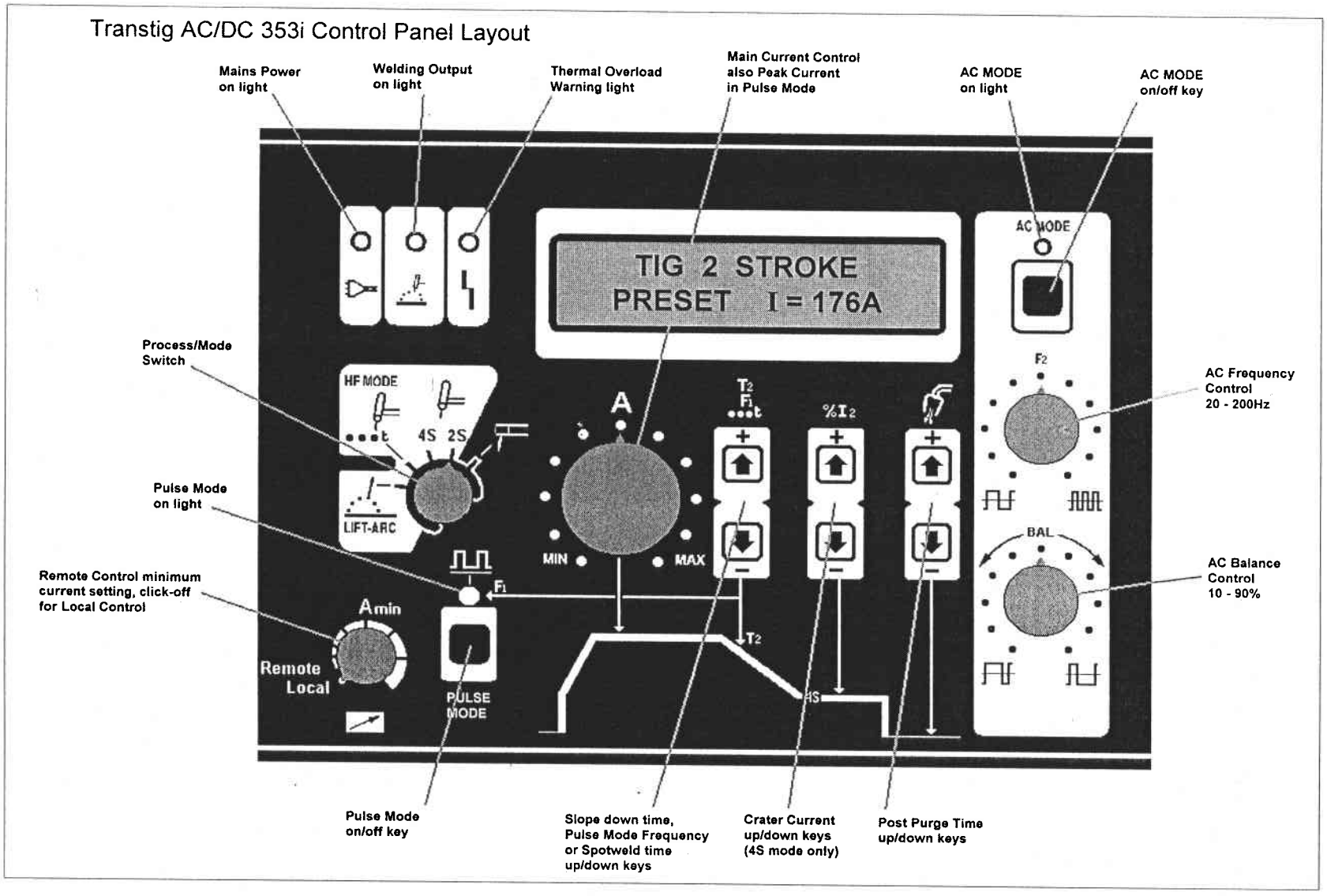
The secondaries of Txl and Tx2 are rectified using parallel sets of fast recovery rectifiers. A filter inductor L is included in the positive output and a measuring shunt in the negative. A spike suppression network SN is incorporated across the dc output.

IGBTs Q3-Q6 form a bridge (commutator) network. The polarity of the output can be set +ve or -ve by switching on both Q3 and Q6, or both Q4 and Q5 as required. Switching the diagonal pairs on alternately creates a square wave ac output whose frequency and balance can be continuously adjusted.

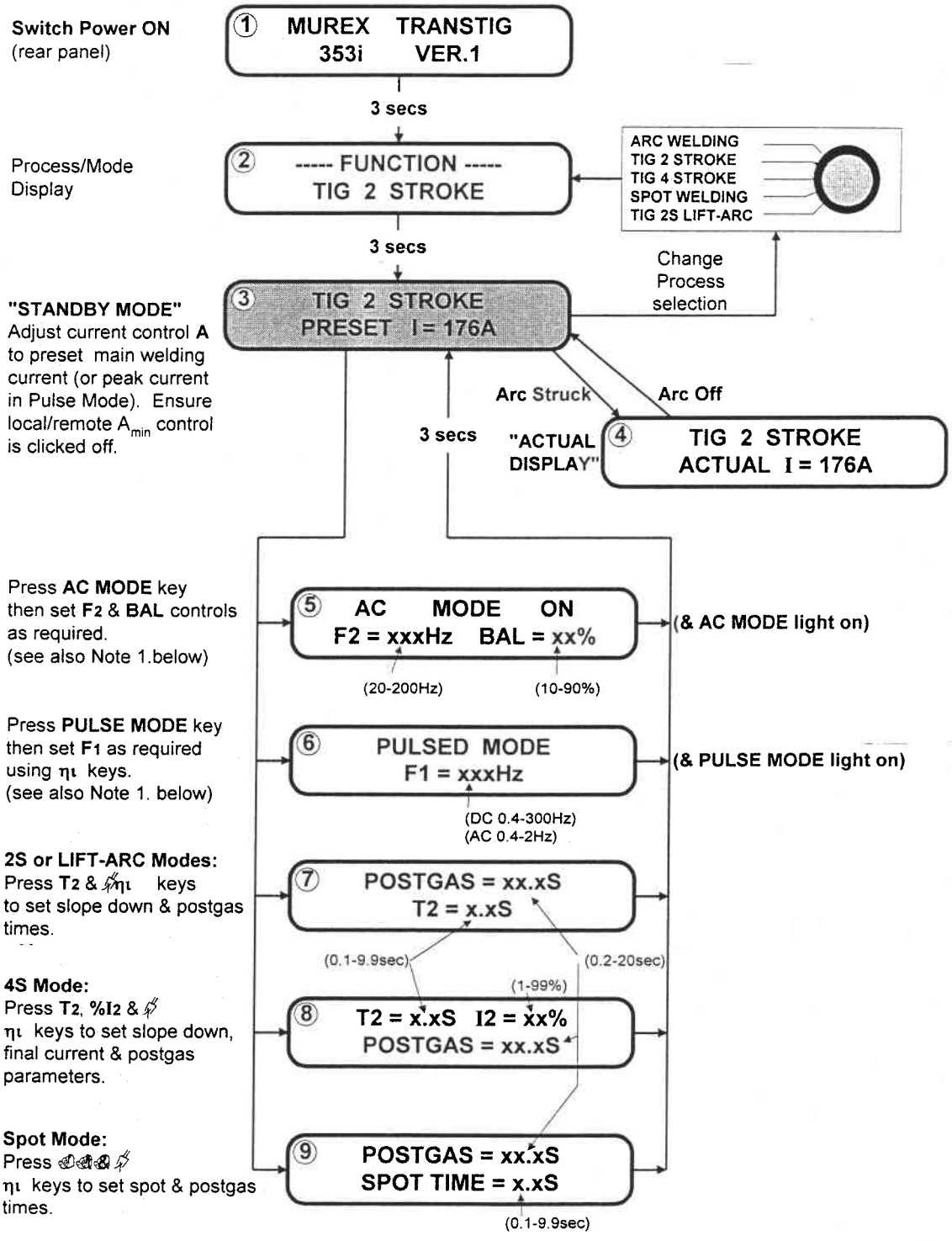
TECHNICAL SPECIFICATION

	AC/DC 203i	AC/DC 353i
Input:		
Mains Supply	415V, 3 Phase, 50/60Hz	415V, 3 Phase, 50/60Hz
Fuses	16A slow	32A slow (20A slow up to 250A TIG)
KVA	6 (5.4kW)	14 (13kW)
P.F.	0.9	0.9
Output:		
TIG Rating	200A 40% duty 160A 60% 100A 100%	350A 40% duty 300A 60% 250A 100%
MMA Rating	190A 35% duty	320A 35% duty
O.C.V.	65V	65V
Controls:		
TIG Current	5-200A	5 - 350A
MMA Current	5-190A	5 - 330A
Minimum Current in Remote Mode	5-100% of main current	5-100% of main current
AC Frequency	20 - 200Hz	20 - 200Hz
AC Balance	10 - 90%	10 - 90%
Pulse Frequency	0.4 - 300Hz DC, 0.4 - 2Hz AC	0.4 - 300Hz DC, 0.4 - 2Hz AC
Pulse Time	33% of cycle time*	33% of cycle time*
Background (when pulsing)	25% of peak current*	25% of peak current*
Slope Down Time	0.1 - 9.9 Seconds	0.1 - 9.9 Seconds
Slope Up Time (4S mode)	1.5 Seconds*	1.5 Seconds*
Start/Crater Current (4S mode)	1 - 99% of main current	1 - 99% of main current
Pre Purge Time	0.5 Seconds*	0.5 Seconds*
Post Purge Time	0.2 - 20 Seconds	0.2 - 20 Seconds
Spot Weld Time	0.1 - 9.9 Seconds	0.1 - 9.9 Seconds
Arc Force/Hot Start (MMA)	35%*	35%*
Dimensions: (Power Source)		
Height	510mm	520mm
Width	240mm	290mm
Depth	500mm	540mm
Weight	25kg (Net)	34kg (Net)
Standards:	EN60974-1 & EN50199	EN60974-1 & EN50199
	* Other values on request	* Other values on request

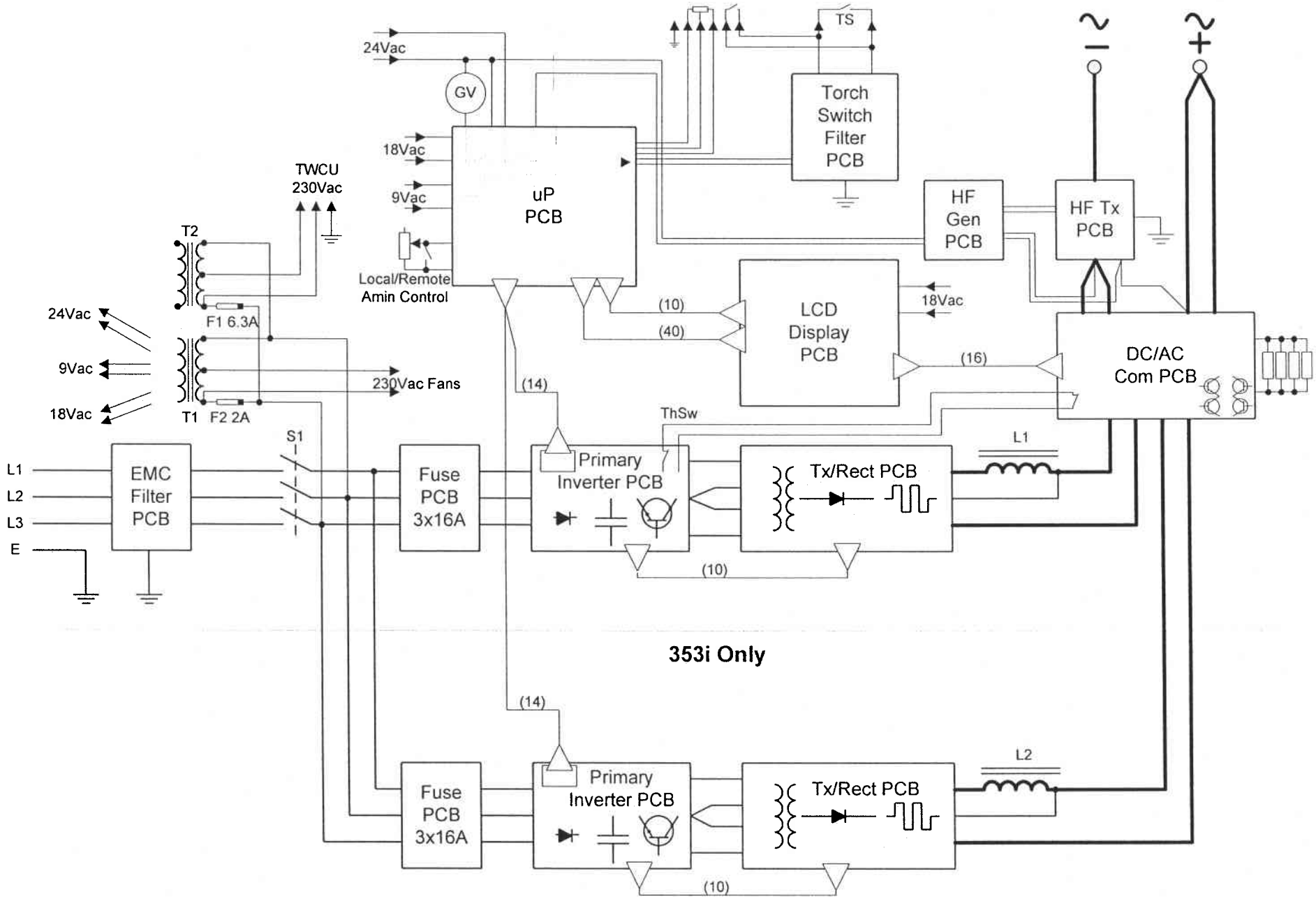
Transtig AC/DC 353i Control Panel Layout



Transtig AC/DC 353i LCD Display Modes



Note1. To revert to DC, or to cancel Pulse Mode, at the main menu press and hold either the AC MODE key or PULSE MODE key for roughly 3 seconds until the light above it goes off



Transtig AC/DC 203i & 353i

THE μP (LOGIC) PCB

This PCB contains the basic μP control system for the machine(s). Note that the PCB (and the software) is actually identical between 203i and 353i units but JP2 is linked in the case of the 353i, see page 13. The PCB contains the battery backup system (>3.6Vdc without mains power).

The PCB receives the following inputs:

18Vac	Used to make the +5, +15 & -15Vdc rails
9Vac	Used for the isolated torch switch and footcontrol circuits
24Vac	Used by the gas solenoid and to enable the HF generator PCB
Torch Switch	From the torch switch filter PCB
Footcontrol Pot	From the 14 pin remote control socket
Shunt Feedback (Iout+ & Iout-)	From the shunt(s) on the Tx/Rect PCB(s) via the primary inverter PCB(s)
Voltage Feedback	From the Tx/Rect PCB(s) via the primary inverter PCB(s)
Overtemperature Signal	From the various thermal switches via the primary inverter PCB(s) (+5Vdc if tripped)
Local/Remote A_{min} control	Sets the control mode to remote and enables the remote start point current to be preset (the remote control device must be connected)
LCD Display PCB Status	Information on the control panel settings. Note that AC frequency and balance signals are generated on the LCD Display PCB and output to the DC/AC Com PCB directly from there

The PCB has the following outputs:

+15 & -15Vdc rails	To power the primary inverter PCB(s) input circuitry
I_{set}	Current command reference to the primary inverter PCB(s) input circuitry
INH	Starts and stops the primary inverters ("1" to inhibit)
HF on/off	24Vac to HF generator PCB to enable HF
Gas on/off	24Vac to energise the gas solenoid
LCD display signals	So the LCD Display shows the control levels including "preset" and "actual" welding current, overtemperature and output short circuit etc.

The μP PCB has 3 preset type potentiometers:

R65	Sets the output welding current as measured by an external standard verses the "preset" value. Adjust in dc TIG 2S mode with the HF disabled
R67	Sets the "actual" current as shown in the LCD display verses an external standard
R66	Sets the arc voltage detection point (~+15V). **Do not adjust**

When validating/calibrating the 353i, remember to check that the output current is shared equally between the 2 sets of Primary Inverter and Tx/Rect PCB assemblies. Refer to the drawing of the Tx/Rect PCB assembly, page 18, and note that the shunt output can monitored as indicated. The scaling is 70mV per 100A. So when the 353i is delivering 200A there should be 70mV (±2mV) from each Tx/Rect PCB shunt.

The I_{set} output can be checked with the µP PCB disconnected from the primary inverter PCB(s) as described in 6. on page 13.

LCD DISPLAY PCB

Comprises the control potentiometers (excluding Local/Remote A_{min} control), key switches, LED indicators and the large scale LCD display. The PCB is identical in both machines. Inputs/Outputs are the 18Vac auxiliary supply, and 40 and 10 way ribbon connections to/from the µP Logic PCB. The LCD Display PCB also contains the AC frequency and balance generating circuits and drives the IGBTs on the DC/AC Com PCB through the 16 way ribbon cable connection J1. The IGBT drive signals can be checked whilst the machine is idling as follows. Switch off mains power. Disconnect the16 way ribbon cable connector J1 from the DC/AC Com PCB. Refer to page 19 and install 4off 10kΩ 0.5W resistors into the J1 connector between 1 & 2, 7 & 8, 9 & 10, 15 & 16. Switch power on. Use a dc voltmeter and measure across each resistor - the following values should be obtained:

DC	2 - 1	+15V	**AC** (50Hz, 50%Bal)	2 – 1	+3.5V
	10 – 9	+15V		10 – 9	+3.5V
	7 – 8	-8V		7 – 8	+3.5V
	15 – 16	-8V		15 – 16	+3.5V

FUSE PCB(s)

The fuse PCB contains 3x 16A slow fuses and varistors to protect the Primary Inverter PCB. Note that the fuses (32x6.3mm) are each soldered into their retaining clips so that it is simpler to replace the entire PCB rather than trying to replace individual fuses. To change an individual fuse the best way is to first break the fuse in half using a pair of pliers, **but beware of flying glass!**

HF GENERATOR PCB

Inputs to this PCB are the OCV from the "cold" side of the HF coupling transformer PCB and a 24Vac enable signal from the µP PCB. Its output forms the single turn primary of the HF coupling transformer, do not reverse the orientation of this winding. The spark gap setting should be 0.9mm (.035").

DC/AC COM PCB ASSEMBLY

Comprises 4 sets of parallel IGBTs arranged in a bridge configuration, together with protection diodes. Each individual IGBT can switch up to 50A. In addition a voltage

limiting circuit is incorporated preventing the dc voltage across the input of the bridge from exceeding 400V for ~2μsec. In this event a transistor automatically connects a load resistance across the dc line. Drive signals for the 4 banks of IGBTs come direct from the LCD display PCB via a 16 way ribbon cable. Thermal switches protect the IGBTs.

LCD DISPLAY ERROR MESSAGES

- ATTENTION
OVER TEMPERATURE (and thermal overload LED flashing)

Check all the cooling fans are running. If the machine does not reset automatically after a few minutes check the wiring and thermal switches individually using a continuity tester. **WARNING high voltages are present on the primary inverter PCB heatsinks.** Measure the voltage between 0v and TP2 on the primary inverter PCB daughter board(s), see drawing page 16. If a thermal switch is tripped this will be +5Vdc otherwise there should be no volts here.

- SHORT CIRCUIT
  REMOVE IT!

Indicates output voltage is <15V when either MMA mode is selected or the torch switch (footcontrol) is operated, i.e. shows when OCV is not detected. This could be because the tungsten or MMA electrode is shorted to the work or because a low value resistance is across the output terminals. If this message appears and no external short exists refer to the faultfinding section

FAULT FINDING

Ensure the mains power LED and LCD display are on. If not check that all 3 supply phases are present at the input and that the 2A rear panel fuse F2 and 18Vac auxiliary to the LCD display PCB are OK.

At power switch on, watch the LCD display first shows the machine type and software version, then the process mode as set by the process selector switch, and finally the standby mode (process mode selected and "preset" current). Check that all the cooling fans are running.

Set the A_{min} control to local control mode (fully anticlockwise). Confirm that the control functions all work correctly by monitoring the LCD display as the various rotary and key switch controls are operated. Ensure the display reverts to the standby mode within 3 seconds of the last parameter adjustment.

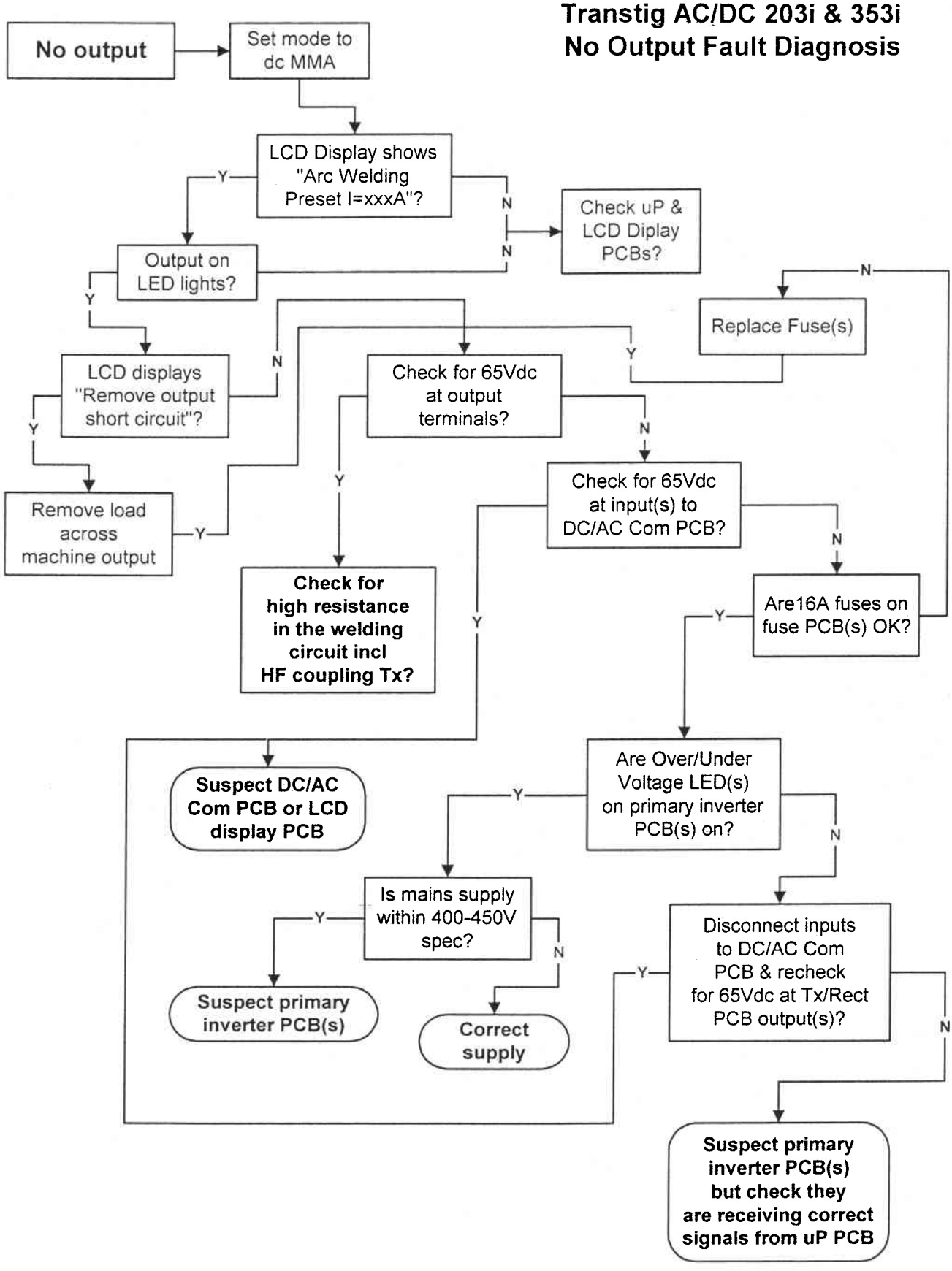
If the control functions appear incorrect carry out a "general reset" as follows. Switch off the power switch, press and hold the AC mode key whilst switching the power back on, keep the AC key pressed until the display is in standby mode. Recheck the control functions. Replace the μP PCB and/or the LCD Display PCB if errors are still apparent.

Some Simple Checks in dc TIG 2S Mode (confirm the gas supply is on)

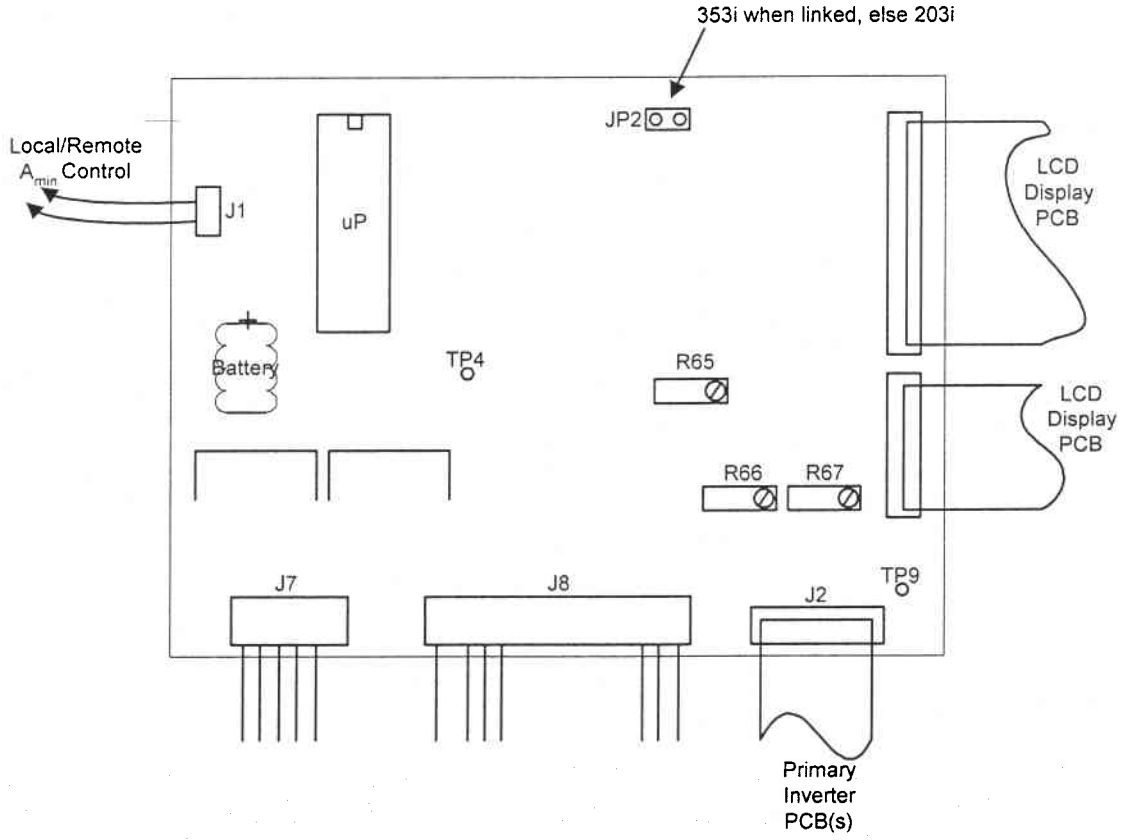
Press the torch switch/footcontrol:

1. Nothing happens?	Check torch switch (footcontrol) circuit & 9Vac auxiliary supply. To eliminate the torch switch filter PCB try shorting together pins 7 & 8 of connector J8 on the μP PCB. In remote control mode the "preset" amps should run up and down as the footcontrol is operated
2. Does gas flow?	If not check the solenoid & 24Vac supply. See 1. also
3. Does HF run?	If not check for the 24Vac enable signal to the HF generator PCB & that OCV is present. If both signals are OK suspect the HF generator PCB
4. Will the arc strike?	If not check for a break in the welding circuit esp. if the HF is running but no arc follows up
5. Can the arc be scratch started?	If not check for OCV behind the HF coupling Tx PCB

Transtig AC/DC 203i & 353i
No Output Fault Diagnosis



Transtig AC/DC 203i & 353i
µP LOGIC PCB



1. Battery voltage – measure with mains power off. Should be ≥3.6Vdc

2. R65 sets current measured by an external standard verses "PRESET" amps on the LCD display. Check and adjust on resistive load in DC TIG mode (2S) with HF disabled by removing HF generator PCB connector

3. R67 sets "ACTUAL" amps on the LCD display verses current measured by an external standard. Check and adjust in DC TIG mode (2S) with HF disabled by removing HF generator PCB connector.

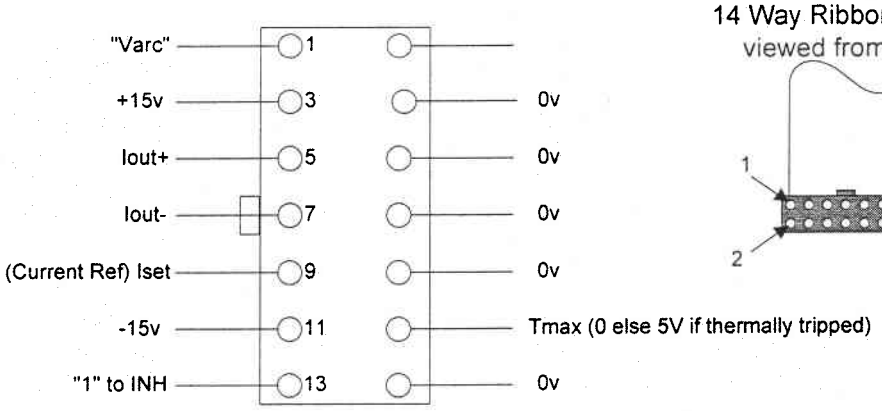
4. R66 sets arc voltage detect point, nominally 15v, **do not adjust**

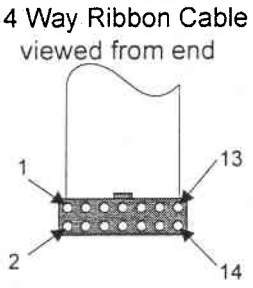
5. TP9 is 0v or signal ground

6. TP4 is I_{set} the current demand reference to the primary inverter PCB(s). This should be variable in the range 0 to 3.75Vdc (0 to 4.4Vdc in 203i) according to the main current control (preset). Check in DC MMA mode as follows. Switch off mains power. Disconnect ribbon cable(s) from primary inverter PCB daughter board(s). Jumper sockets 1 - 3 of the ribbon cable connector removed and also sockets 12 – 14, refer to page 14. Note this only needs to be done to one of the 2 ribbon cables in a 353i. (This simulates the presence of OCV and cheats the thermal switch signals). Select MMA mode and switch on mains power. After checking switch off mains and replace connectors etc.

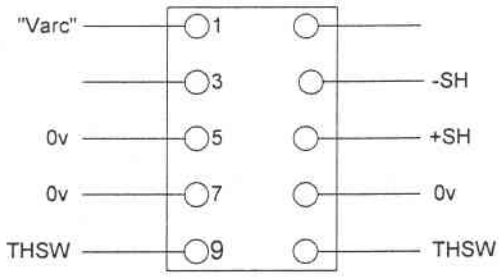
Transtig AC/DC 203i & 353i

14way Ribbon Cable
uP PCB to Primary Inverter PCB

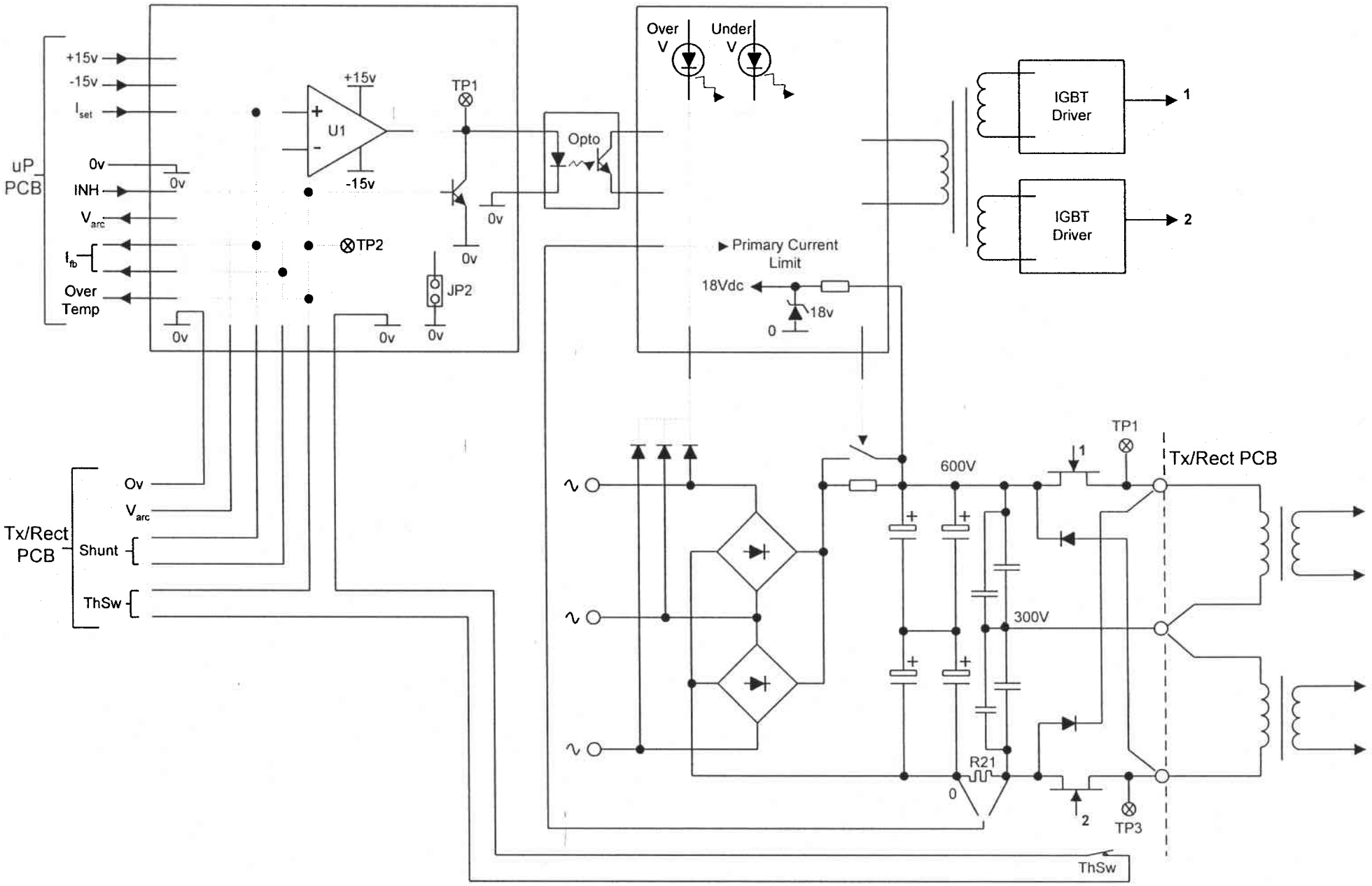




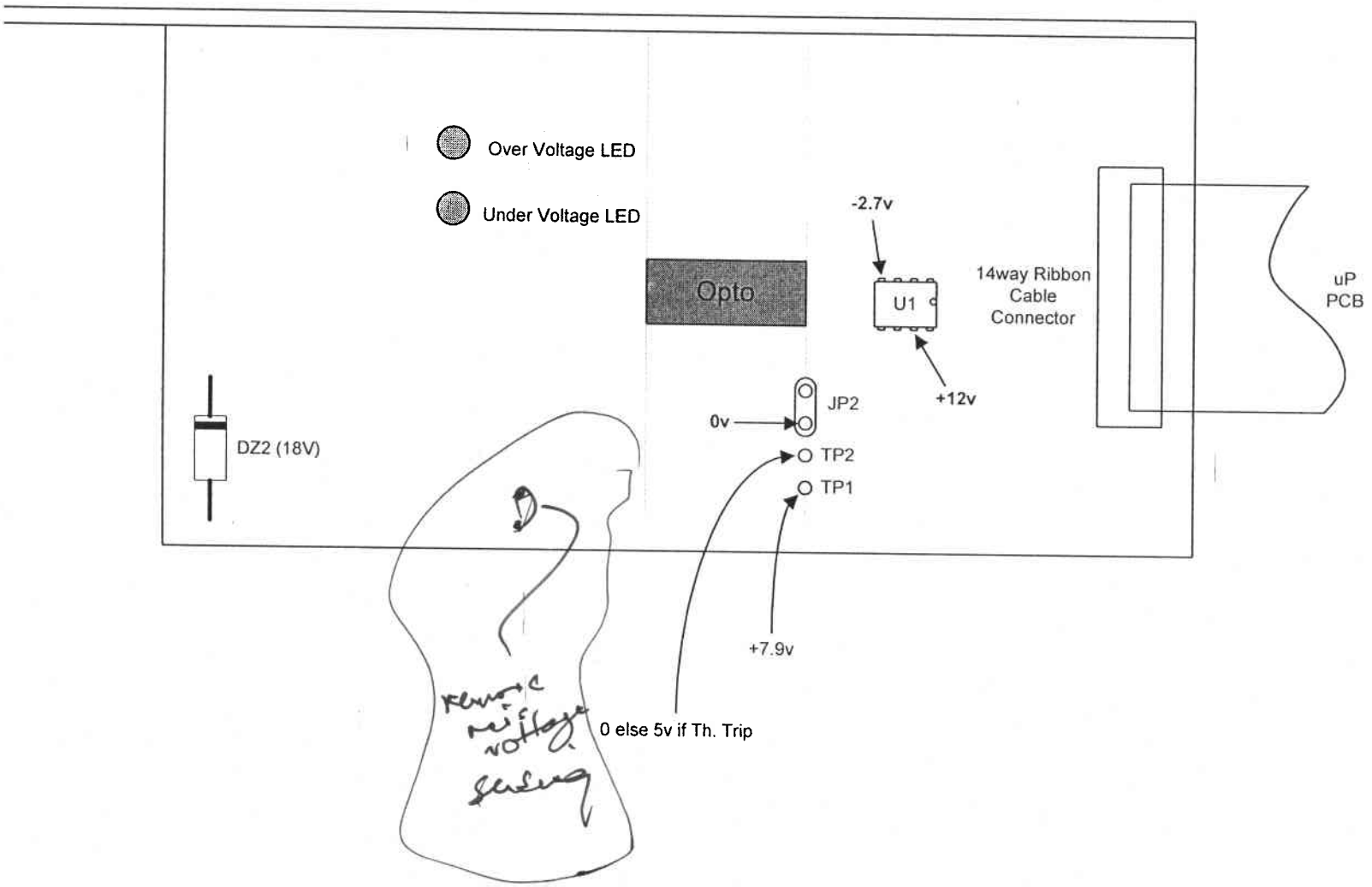
10way Ribbon Cable
Primary Inverter PCB
to Tx/Rect PCB



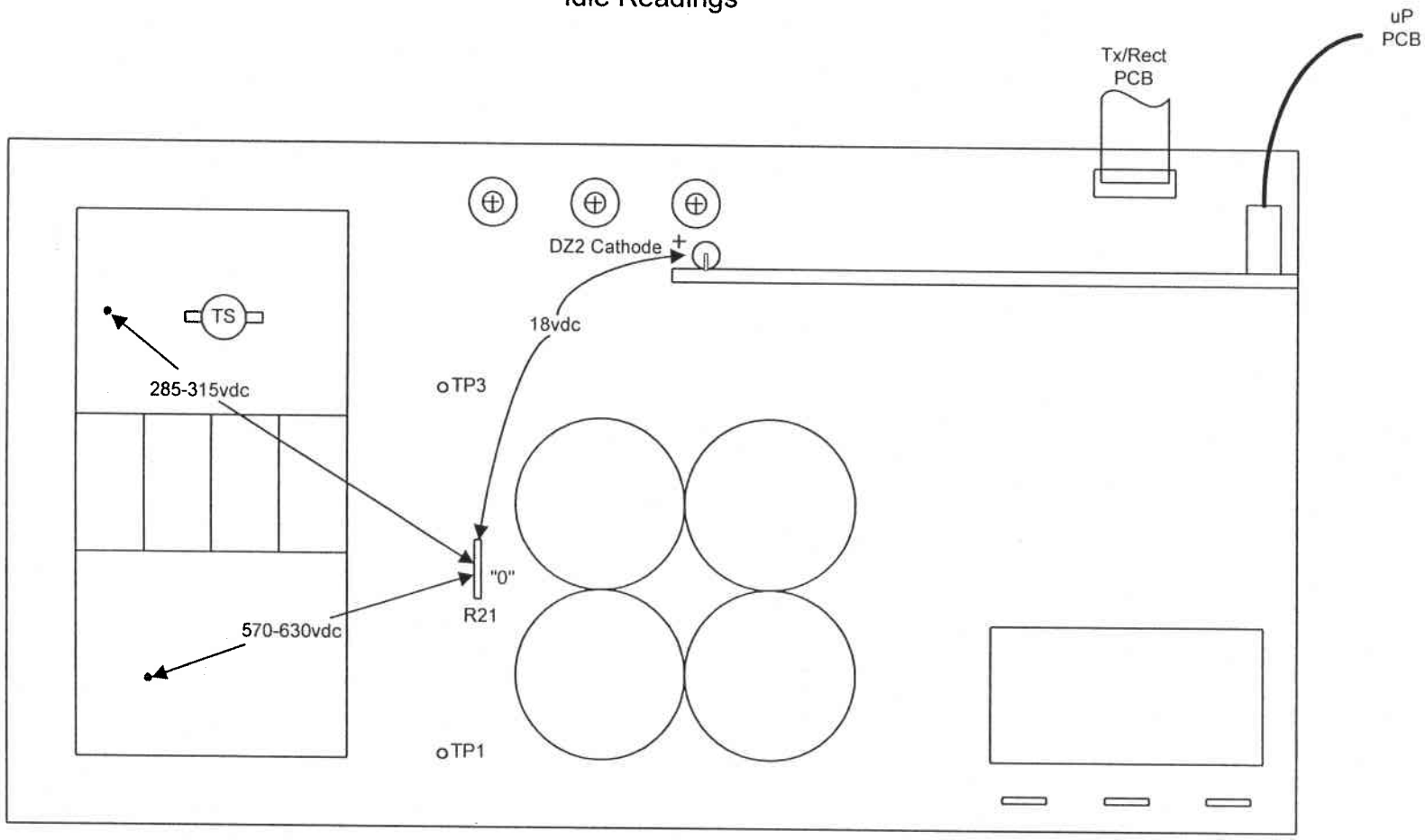
Transtig AC/DC 203i & 353i
Primary Inverter PCB

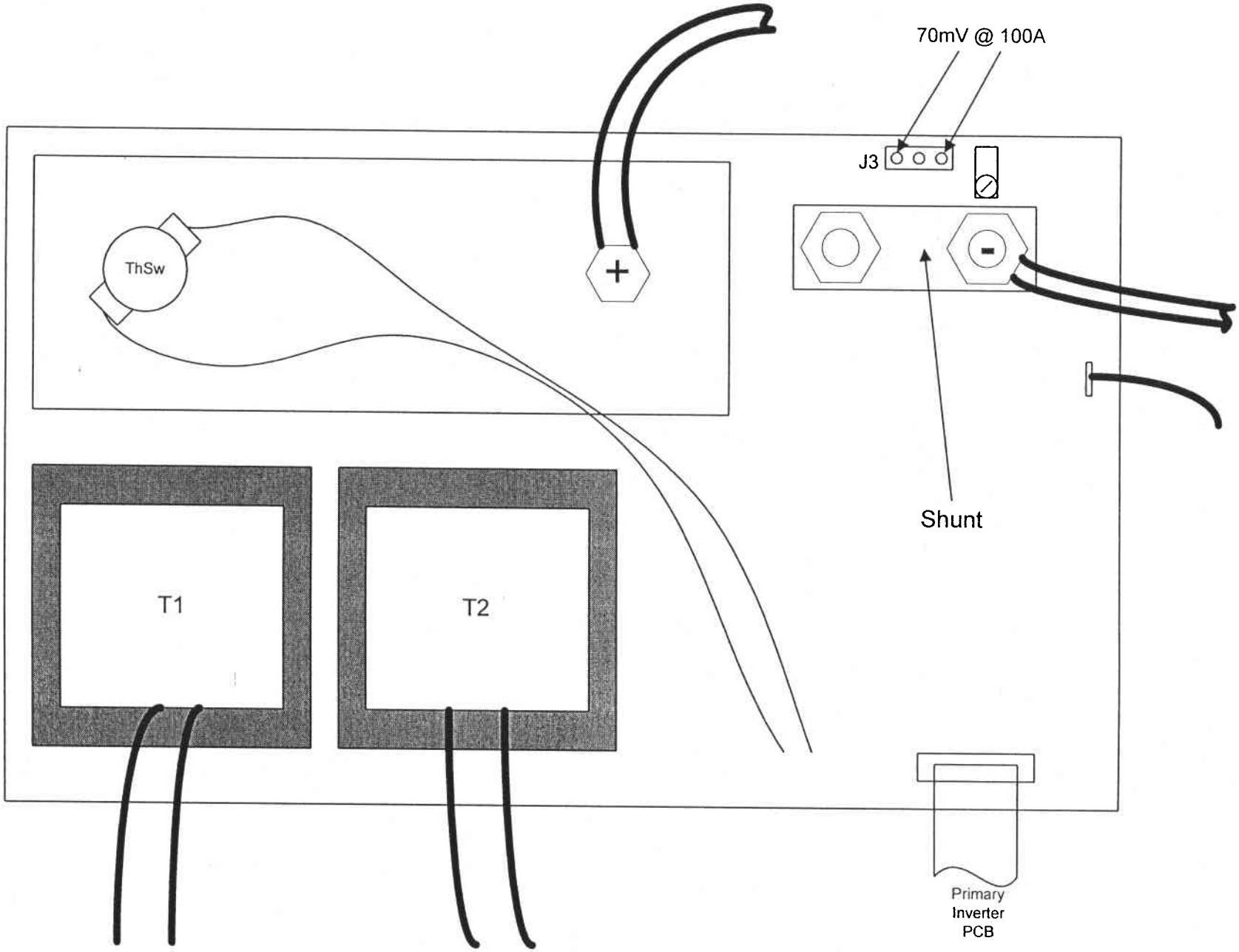


Transarc DC 203i & 303iE
Primary Inverter PCB
"Daughter" Board
Idle Readings



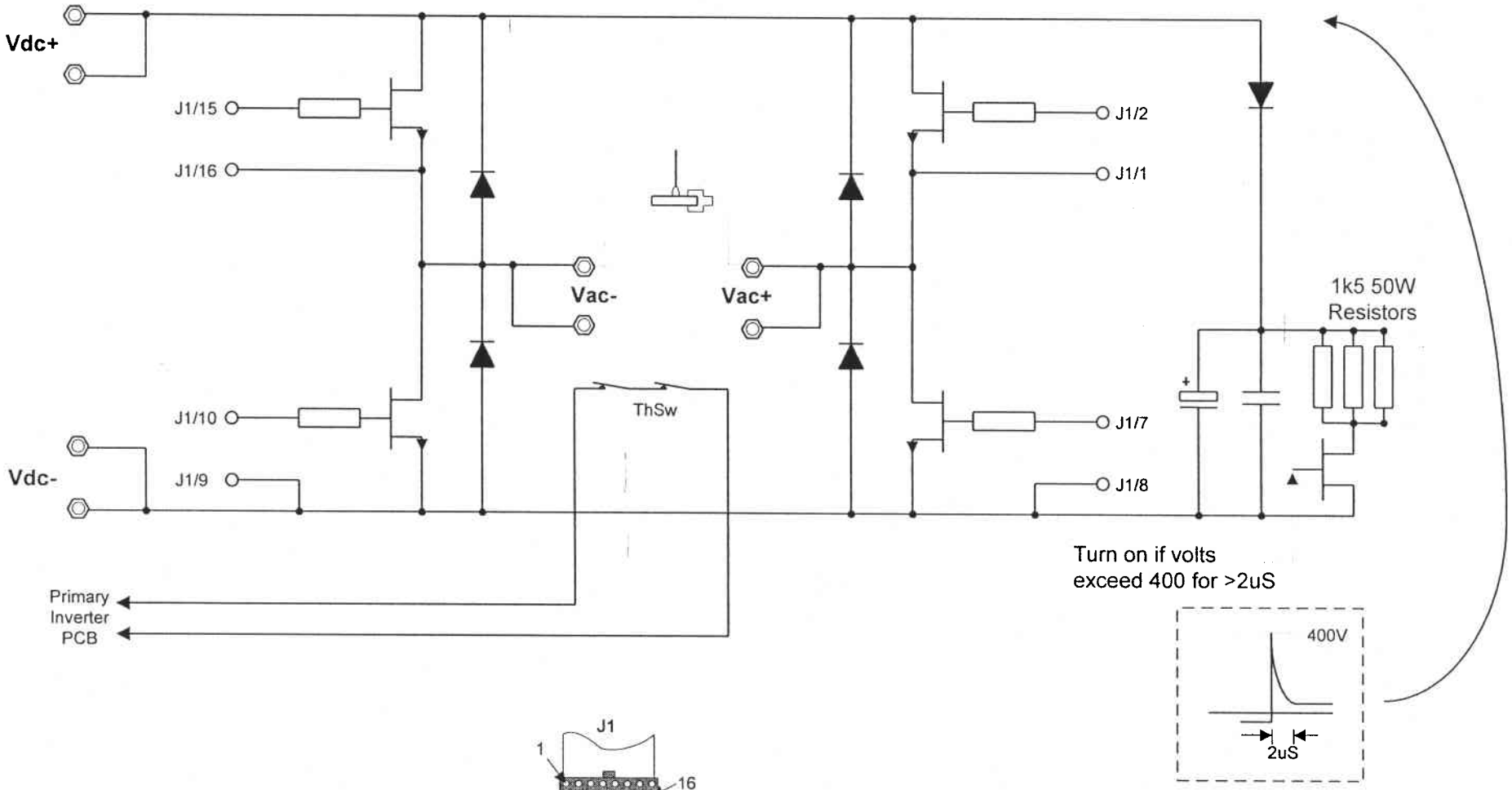
Transarc DC 203i & 303iE
Primary Inverter PCB
Idle Readings

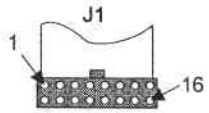




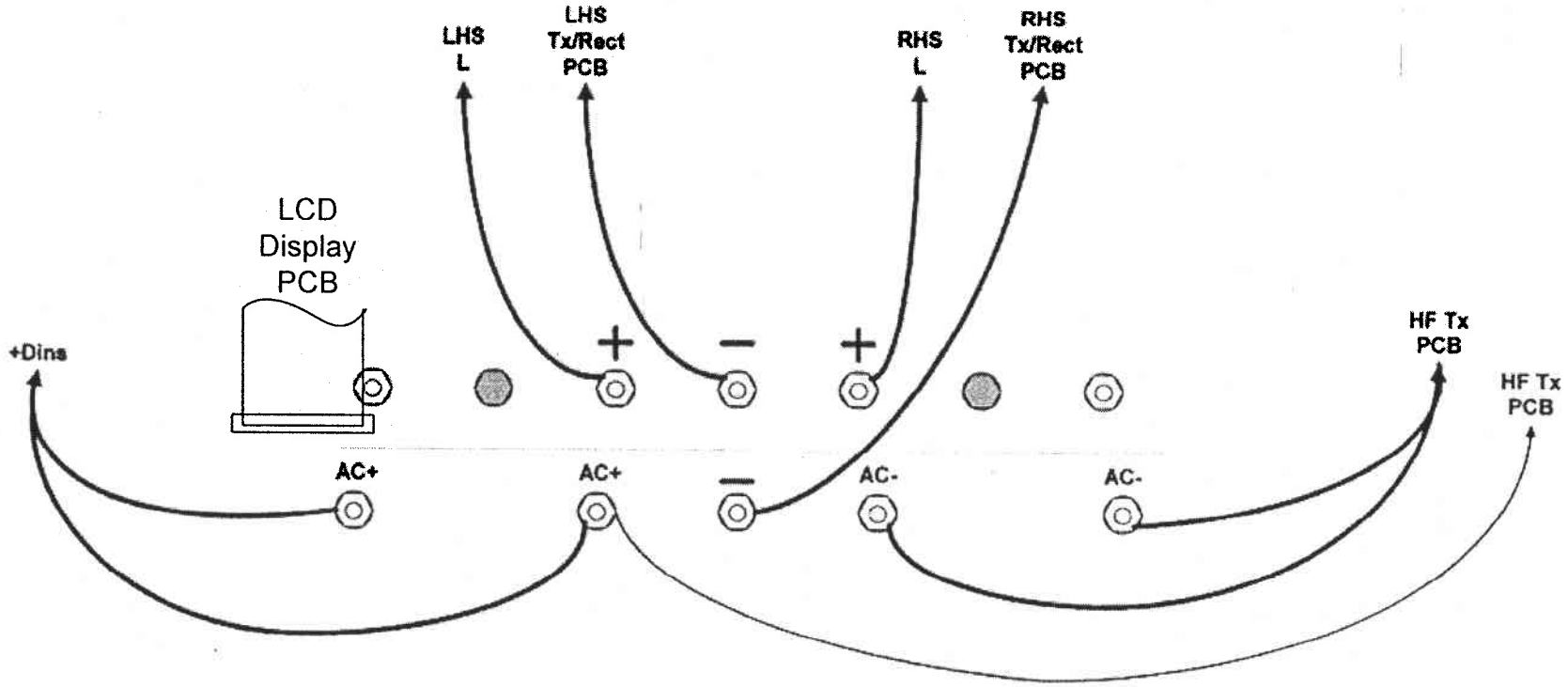
AC/DC 203i & 353i
Transformer/Rectifier PCB

Transtig AC/DC 230i & 353i
DC/AC Com PCB





16 Way Ribbon Cable
from LCD Display PCB
(viewed from socket connector
on end of cable)


LHS
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PCB
HF Tx
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AC+
AC+
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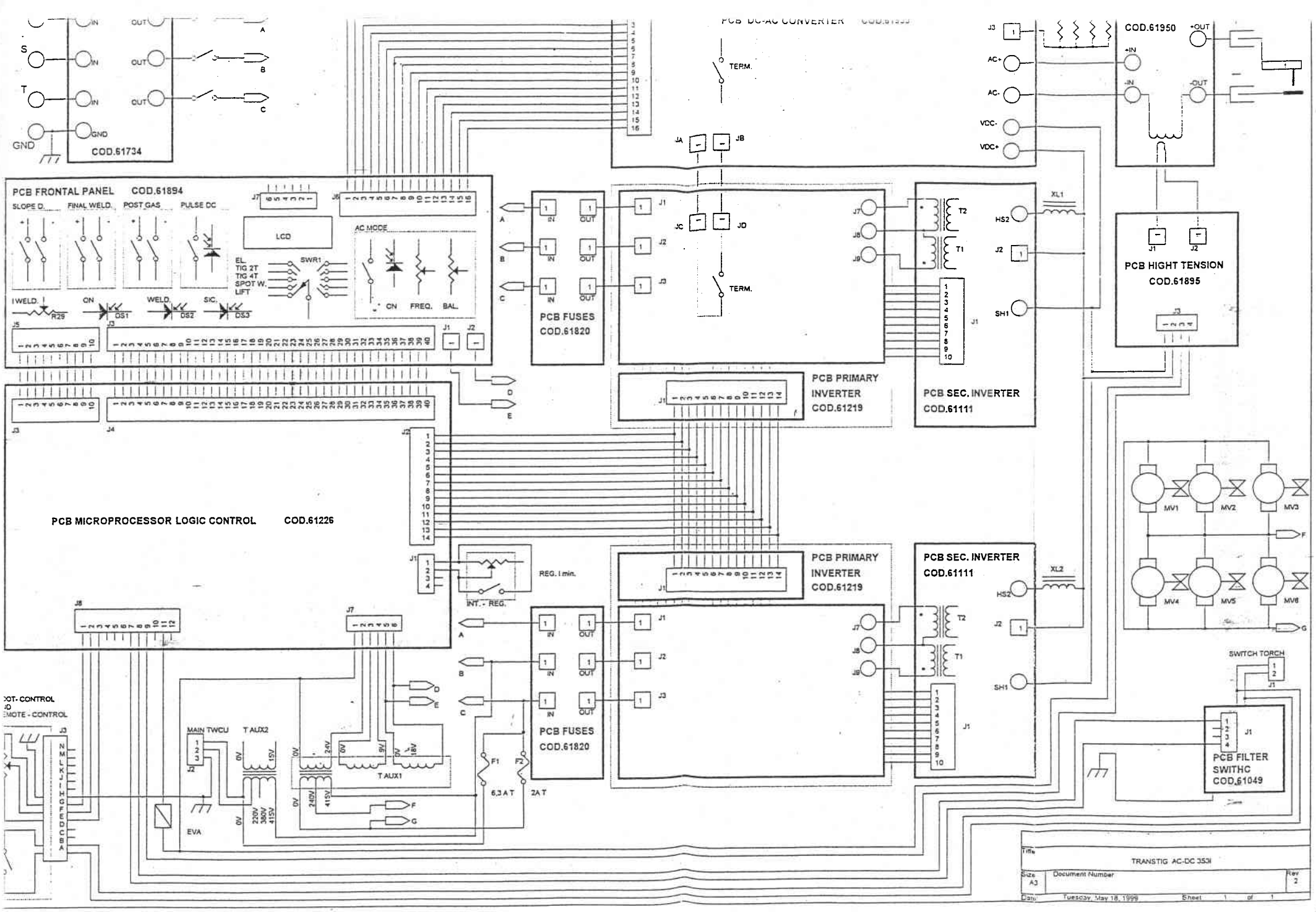
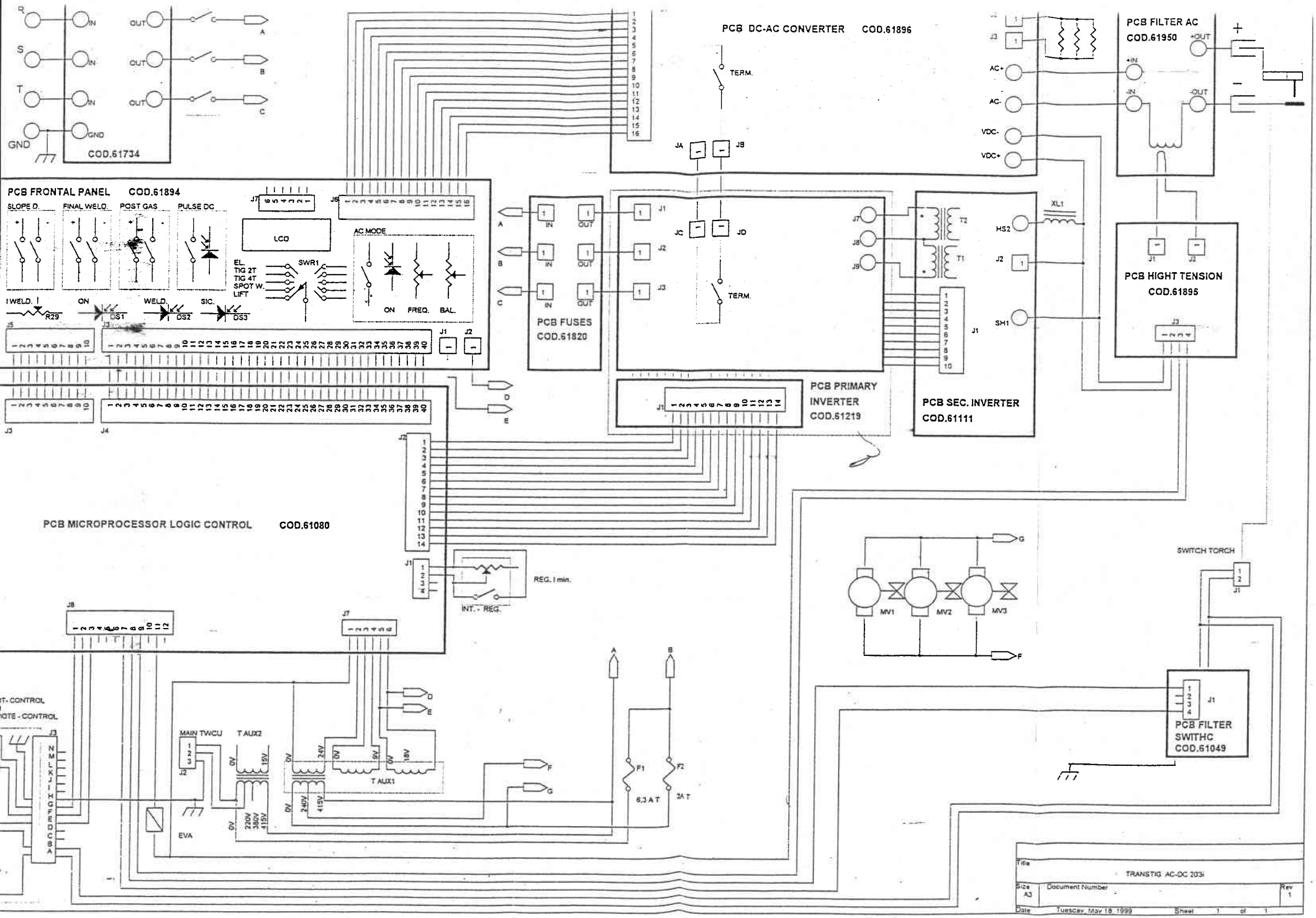
AC-
AC-


COD.61734
PCB FRONTAL PANEL COD.61894
SLOPE D.
FINAL WELD.
POST GAS
PULSE DC
LCD
AC MODE
SWR1
EL
TIG 2T
TIG 4T
SPOT W.
LIFT
PCB MICROPROCESSOR LOGIC CONTROL COD.61226
PCB FUSES COD.61820
PCB PRIMARY INVERTER COD.61219
PCB SEC. INVERTER COD.61111
PCB DC-AC CONVERTER
TERM.
COD.61950
PCB HIGHT TENSION COD.61895
PCB FILTER SWITHC COD.61049
SWITCH TORCH
REG. I min.
INT. - REG.
MAIN TWCU
T AUX2
T AUX1
EVA
F1
F2
6,3 AT
2AT
MV1
MV2
MV3
MV4
MV5
MV6
TRANSTIG AC-DC 353I
Document Number
Tuesday, May 18, 1999


R
S
T
GND
IN
OUT
A
B
C
COD.61734
PCB DC-AC CONVERTER COD.61896
TERM.
JA
JB
PCB FILTER AC
COD.61950
+OUT
+IN
-IN
-OUT
AC+
AC-
VDC-
VDC+
PCB FRONTAL PANEL COD.61894
SLOPE D.
FINAL WELD.
POST GAS
PULSE DC
LCD
AC MODE
ON
FREQ.
BAL.
EL.
TIG 2T
TIG 4T
SPOT W.
LIFT
SWR1
I WELD.
WELD.
SIC.
R29
DS1
DS2
DS3
PCB FUSES
COD.61820
JC
JD
PCB PRIMARY
INVERTER
COD.61219
PCB SEC. INVERTER
COD.61111
T2
T1
HS2
SH1
XL1
PCB HIGHT TENSION
COD.61895
PCB MICROPROCESSOR LOGIC CONTROL COD.61080
REG. I min.
INT. - REG.
MV1
MV2
MV3
SWITCH TORCH
PCB FILTER
SWITHC
COD.61049
MAIN TWCU
T AUX2
T AUX1
EVA
F1
F2
6,3 A T
2A T
0V
15V
24V
9V
18V
220V
380V
415V
240V
TRANSTIG AC-DC 203i
Size A3
Document Number
Rev 1
Date Tuesday, May 18, 1999
Sheet 1 of 1